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Composite Bulkhead Fabrication Development

The primary objective is to design, fabricate, and evaluate by empirical analysis a composite bulkhead produced by a fabrication concept utilizing vacuum and/or autoclave pressure to hold preformed welded sandwich elements in place during bonding and aging.

Included is a minimum of design for a 105-inch diameter composite bulkhead for the purpose of approaching space flight type hardware upon which the principal objective (evaluation of dimensional behavior) can be accomplished. The bulkhead is designed and fabricated from 2219 aluminum alloy skins chem-milled on one side only to a 0.060 inch thickness except in the weld land areas where they remain a nominal 0.090 inch thickness. The outer skin is assembled by welding eight stretch-formed and chemically-milled gore segments into a welded skin assembly slightly smaller than the concave bonding and aging tool.

Final form is fixed in the approved concave forming and aging tool by age forming the outer skin under vacuum and 60 psig autoclave pressure at 325°F for 16 hours. A honeycomb core of one-inch thickness heat resistant phenolic is bonded to the outer skin with adhesive film cured at 325°F for one hour at 30 psig autoclave pressure. The inner skin is

final formed against the core at 60 psig autoclave pressure for 16 hours at 325°F and then bonded to the core with adhesive for a one-hour cure period.

Additional cure and aging time of 6 3/4 hours is applied to the inner skin and assembly, to approach the desired minimum inner skin aging time of 24 hours, to provide maximum corrosion resistance to the alloy. Measurements of the welded skin assemblies are taken in the free state, under vacuum, after aging, and after bonding into an assembly, and are compared with the inside contour of the concave bonding and aging tool as the dimensional base.

Note:

Inquiries concerning this development may be directed to:

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Reference: B66-10582

Patent status:

No patent action is contemplated by NASA.

Source: James Orr
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